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20. ABSTRACT

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The main causes were caries (52 percent) and gingival conditions (22 percent). The remaining 16 percent included fractured teeth (5 percent), broken prostheses (4 percent), and miscellaneous conditions (7 percent). Dental emergencies comprised 21.5 percent of the total medical sick call. Seventy-four percent of the dental emergencies were judged to be preventable.

The estimated lost duty time was 318 days for an observed rate of 13 days per 1000 troops and an estimated annual rate of 121.5 per 1000 troops. The most significant factor affecting lost duty time for treatment appeared to be the availability of transportation to and from the treatment facility.

ANALYSIS OF DENTAL CAUSALTIES IN PROLONGED FIELD TRAINING EXERCISES

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INTRODUCTION

The purpose of this study was to determine the incidence, causal factors, and amount of lost duty time experienced by U.S. Army personnel due to dental emergencies under simulated combat conditions.

The preservation of the fighting strength of the Armed Forces is the primary function of health care providers in the military. This function is carried out in two basic ways. The traditional and more visible role is care of the sick and wounded. A second and equally important role is preventing loss of personnel because of illness. Due to current scenarios, the need for insuring that every available soldier is present, able, and ready to perform his duty, from a medical standpoint, is more critical than ever before.

Factors which have served to magnify the importance of preventing medically-related lost duty time include the increased intensity of the modern battlefield, the interdependence and sophistication associated with crew-served weapons systems, potential lack or delay of medical evacuation, and the likelihood of limited reinforcements against a numerically superior force. The prevention and treatment of dental disease has been, and continues to be, an important factor in maintaining the fighting strength of the Army.

The largest number of soldier complaints in 1943 concerned the lack of adequate dental support.[5] During 1952 in Korea, there were 8,508 inpatient admissions and 133,720 outpatient visits requiring 493,441 dental treatments.[12] In Vietnam in 1967, 1,317,952 dental procedures were performed on 557,426 patients.[9] During 1968 in Vietnam, 125 soldiers per 1000 reported to dental sick call.[9] Eighty percent of these dental sick

call visits were the result of caries requiring the extraction or restoration of teeth.[9] A recent report by Hawryluk[3], described the sick call experienced by an armored division deployed to the field for 14 days. Of the 642 soldiers reporting to sick call, 212 were for trauma. Of the remaining 430 cases, 66 (15 percent) were due to dental complaints. Dental complaints ranked second only to upper respiratory infections as a cause of lost duty time. All of these factors serve as justification for the need of this research project.

Existing data from previous conflicts give an idea of the magnitude of the dental support requirements; however, it is often incomplete and lacks sufficient detail to permit an analysis of the incidence, causal factors, and amount of lost duty time associated with dental emergencies. This study addressed these problems and can serve as a basis for implementation of more effective prevention of lost duty time due to dental emergencies.

MATERIALS AND METHODS

The field dental records of all active duty personnel reporting for treatment during Joint Readiness Exercises Empire Glacier-78 and Brave Shield-17 were collected for analysis.* Empire Glacier was conducted at Fort Drum, New York, from 12 January 1978 to 5 February 1978 and involved approximately 7,500 Army personnel. Brave Shield-17 was conducted at Fort Irwin, California, from 2 through 17 April 1978 and involved 17,500 Army personnel. The total population studied consisted of 24,500 active duty Army personnel.** Data was collected over a 39-day time period. The exercises were conducted under simulated combat conditions. The field dental records were collected and analyzed to determine the chief complaint, the treatment received, the number of visits per patient, and the patient's rank.

* The raw data was collected under USAIDR Protocol number OH-6030 unit 004 approved 21 August 1977.

** The total numbers of Army Personnel was supplied by Officer of the Surgeon, HQ, XVIII Airborne Corps, Fort Bragg.

RESULTS

Four hundred thirty-six (436) personnel of participating services reported for dental treatment. Receiving routine non-emergency dental care were forty-one soldiers and thirty-five personnel from other services (Air Force and Marienes). The dental records of these 76 individuals were excluded from the study. The remaining 360 soldiers accounted for 438 patient visits (17.88 per 1000 troops). The presenting diagnosis is recorded in Table I.

The diagnoses were grouped into categories for ease of display and reflect only the cause of pain. For example, a soldier whose chief complaint was "my tooth hurts" might have gingivits and several carious teeth in addition to the fractured tooth which was the source of pain. The only diagnosis used would be "Fractured Tooth." "Gingivitis" was used as a broad category for all gingival conditions except pericoronitis. "Defective Restoration" was used when a restoration was broken or missing in the absence of caries. "Postoperative Problem" was used when the painful condition resulted from a dental treatment initiated but not completed before the soldier arrived for the exercise.

The treatments received by 360 patients are displayed in Table II and are self-explanatory. Not included in Table II were diagnostic or component procedures such as radiographs, exams, cultures, sedative bases, etc. "Postoperative Treatments" included such procedures as suture removal, treatments for alveolar osteitis, etc. The medications which were prescribed are summarized in Table III.

Eight patients were hospitalized for a total of 12 days, for an incidence of 0.33 per 1000 troops. Three of the eight were evacuated for

further treatment, two because of acute, diffuse infection and the third for a fractured jaw. Fourteen patients were referred to other medical services. The total medical sick call was 2,032 patient visits including 438 (21.5 percent) for dental problems.

The amount of lost duty time depended upon how many visits the patient made and the availability of transportation. For soldiers within a short ride or walking distance of the treatment facility, an estimated 73 days, based upon one half day per visit, was lost. Soldiers staged at the various aid stations and transported to and from the treatment facility lost an estimated 224 days of duty time, based upon one day per visit. The three evacuated patients were lost for the remainder of the exercise a total of 22 days. The total estimated lost duty time due to dental emergencies was 318 days, or 13 days per 1,000 troops over a 39-day span. Assuming a constant rate of dental emergencies, this would produce 121.5 lost duty days per 1000 troops per year. The distribution of the patients by rank is presented in Table IV.

TABLE I

PRIMARY DIAGNOSES FROM 360 EMERGENCY
DENTAL PATIENTS OVER 39 DAYS

Diagnoses	E.G.*	B.S.*	Total	Percent	Number/1000 Troops
Caries	44	95	139	38.6	5.67
Pericoronitis	17	41	58	16.1	2.37
Periapical Abcess	18	19	37	10.3	1.5
Postoperative Problem	15	20	35	9.7	1.43
Gingivitis	8	13	21	5.8	0.86
Fractured Tooth	9	9	18	5.0	0.73
Broken Prosthesis	6	7	13	3.6	0.53
Defective Restoration	8	4	12	3.3	0.49
Sinusitis	8	0	8	2.2	0.33
Soft Tissue Trauma	5	2	7	1.9	0.29
Herpes Simplex	1	2	3	0.8	0.12
Sialadenitis	0	3	3	0.8	0.12
P.U.O.*	0	2	2	0.5	0.08
Candidiasis	1	0	1	0.2	0.04
Apthous Ulcer	0	1	1	0.2	0.04
S.U.O.*	0	1	1	0.2	0.04
Fractured Jaw	1	0	1	0.2	0.04
TOTAL	141	219	360	99.4	14.69

*E.G. - Empire Glacier - 78
*B.S. - Brave Shidld - 17

P.U.O. - Pain undetermined orgin
S.U.O. - Swelling undetermined origin

TABLE II

TREATMENTS RECEIVED BY 360 SOLDIERS
REPRESENTING 438 PATIENT VISITS OVER 39-DAYS

Treatment	E.G.*	B.S.*	Total	Percent	Number/1000 Troops
Temporary Restorations	65	92	157	33.1	6.41
Extractions	44	53	97	20.4	3.96
Gingival Procedures	23	57	80	16.8	3.27
Postoperative Treatments	29	38	67	14.1	2.73
Endodontic Procedures	17	26	43	9.1	1.76
Permanent Restorations	8	10	18	3.8	0.73
Prosthesis Repairs	6	7	13	2.7	0.53
TOTAL	192	283	475	100	19.39

*E.G. - Empire Glacier - 78
*B.S. - Brave Shield - 17

TABLE III

MEDICATIONS RECEIVED BY 360 SOLDIERS

	E.G.*	B.S.*	Total	Percent
Analgesics	123	87	210	78.9
Antibiotics	28	19	47	17.7
Antihistamines	6	0	6	2.3
Antifungal	1	0	1	0.3
Antiinflammatory	1	1	2	0.8
TOTALS	159	107	266	100

*E.G. - Empire Glacier - 78
*B.S. - Brave Shield - 17

TABLE IV

DISTRIBUTION BY RANK OF 351
DENTAL EMERGENCY PATIENTS

Rank	E.G.*	B.S.*	Total	Percent
E-1	13	14	27	7.7
E-2	16	34	50	14.2
E-3	23	27	50	14.2
E-4	45	61	106	30.2
E-5	22	32	54	15.4
E-6	12	15	27	7.7
E-7	3	8	11	3.1
E-8	0	2	2	0.5
E-9	0	1	1	0.3
Subtotal	134	194	328	93.4
O-1	0	6	6	1.7
O-2	1	2	3	0.8
O-3	2	6	8	2.2
O-4	1	3	4	1.1
O-5	1	1	2	0.5
Subtotal	5	18	23	6.6
TOTAL	139	212	351	100.0

*E.G. - Empire Glacier - 78
*B.S. - Brave Shield - 17

DISCUSSION

The incidence of field dental emergencies was 17.88 per 1000 troops over 39 days (the annual rate would be 167.36 per 1000 troops). A 16,000-man division could expect 2,678 dental emergency visits per year resulting in 1,944 lost duty days. In Vietnam the reported annual dental sick call varied from 25.5 per 1000 troops in 1966[1] to 125 per 1000 troops in 1968[10] to 143 per 1000 troops in 1969.[9] The relatively high incidence of dental emergencies in the present study may be due to several factors:

1. The availability of dental care, including transportation to and from the treatment facility, is considered optimum in a joint training exercise scenario.
2. Accurate reporting and consolidation of comparable data was easier than in a combat environment.
3. Separation of dental emergency patients from soldiers reporting to dental sick call for routine treatment in past conflicts was not possible with the available historical data.

Considering the above factors, it is believed that the availability of dental care is a most important factor. The time frame of the present study did not allow an analysis of the effect of significant periods of time in the field (3 months, 6 months, etc.) on the incidence of dental emergencies.

The causal factors directly contributing to the incidence of dental emergencies are clear. Caries and periapical abscesses accounted for

48.9 percent. Gingival conditions, including pericoronitis, were responsible for 21.9 percent. Postoperative problems (9.7 percent), fractured teeth (5 percent), broken prosthesis (3.6 percent), and defective restorations (3.3 percent) accounted for the bulk of the remainder.

There is no doubt that a significant number of the 360 soldiers reporting as dental emergencies could have continued to perform their duties without treatment. The relevant fact is that 360 soldiers were absent from duty for a dental emergency. It is extremely difficult, if not impossible, for anyone to objectively quantify the degree of pain an individual may be experiencing. In the personal experience of the authors, very few soldiers reported for emergency dental treatment during these two exercises who did not have obvious cause for complaint.

A basic question, relating to both incidence of, and causal factors associated with dental emergencies, is why the dental conditions were not treated before deployment. There are two concepts that deserve discussion. First, to provide the dental treatment needed by the new recruits each year would require the total treatment capability of the Dental Corps.[6] Because Dental Corps strength is controlled by the size of the active duty force, this situation is unlikely to change for the better. The workload requirement for the existing active duty force per 1000 recruits is calculated to be 6,960 procedures, including 4,000 restorations and 1,000 extractions.[7] These requirements far exceed the capability of the Dental Corps.

The second concept is cooperation. As a premise, the Army has troops who need dental treatment, commanding officers who care about the health and welfare of their personnel, and dental personnel dedicated to providing as much of the treatment as possible. All active duty Army personnel are required to have an annual dental examination. Soldiers

who need dental treatment are identified and given appointments for treatment. In order for the soldier to receive this needed dental treatment, the critical elements of understanting and coordination must produce cooperation. From the dentist's viewpoint, the soldier must come in to be treated. From the line officer's viewpoint, the training and work requirements often exceed the available man-power capability; every soldier is needed all the time to fulfill unit responsibilities. The result of this dichotomy is that the units least accessible to dental care during periods of deployment also tend to be the most heavily involved with training requirements, etc., which limit the individual soldier's opportunity to receive total dental care.

The eventual cost of dental disease, as currently managed, to a commanding officer is either lost duty time or degradation of individual or unit performance. The effect of painful dental conditions on performance has not been studied. The estimated lost duty time in the present study was 121.5 days per 1000 troops per year. How this figure would vary, given the same number of dental emergencies in a combat setting, would depend primarily upon availability of transportation to the treatment facility. Assuming that transportation is better during an exercise than it would be in a combat environment, one might expect a substantial increase in lost duty time during armed conflicts.

There was not an obvious discrepancy between the rank of soldiers presenting with an emergency condition of suspected dental etiology and the percentage distribution of personnel by rank in the study population.

ADDENDUM

After each dental emergency was treated, the patient was counselled on proper oral hygiene; in cases where follow-up treatment was needed, the patient was further advised to report to his post dental treatment facility upon completion of the exercise for the required care.

Two months subsequent to Brave Shield-17, available participant records were analyzed. Of those patients requiring follow-up care, (based on available permanent records) approximately 60 percent had reported to their proper facility and were receiving treatment.

SUMMARY

The field dental records of all soldiers reporting to dental sick call from Joint Readiness Exercises Empire Glacier-78 and Brave Shield-17 were analyzed to determine the incidence, causal factors, and amount of loss duty time due to dental emergencies. Three hundred sixty Army personnel presented as dental emergencies from a total population of 24,500 during a 39-day period, an incidence of 14.7 dental emergencies per 1000 troops. The calculated annual incidence of dental emergencies was 167.36 per 1000 troops.

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The estimated lost duty time was 318 days for an observed rate of 13 days per 1000 troops and an estimated annual rate of 121.5 per 1000 troops. The most significant factor affecting lost duty time for treatment appeared to be the availability of transportation to and from the treatment facility.

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions are drawn from this study:

1. Dental emergencies represent a significant loss of duty time among deployed troops.
2. The majority (74 percent) of dental emergencies are preventable.

Given the unfavorable manpower-workload ratio of the Army Dental Corps, the following recommendations are made to reduce the amount of lost duty time due to field dental emergencies:

1. Insure that soldiers identified as requiring dental treatment receive the necessary care at a specified point in time prior to deployment.
2. Assign priority for the provision of dental care to those units to whom it would be least available in combat, or first deployed.
3. Provide for flexible treatment hours at dental facilities to accomodate troop requirements.
4. Increase emphasis on new preventive and motivational measures, particularly in the area of oral hygiene.
5. Extend the training of paramedical personnel, organic to combat units, to include emergency treatment of appropriate dental conditions, such as pericoronitis.
6. Sensitize commanding officers to the importance of their troops' oral health.

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